



NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

**ANALYSIS OF HUMANITARIAN ASSISTANCE CARGO
TRANSPORTATION**

by

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ABSTRACT

Humanitarian assistance is of growing importance to the United States and the Department of Defense's strategic objectives. Thus, United States combatant commands increasingly rely on humanitarian assistance cargo transportation programs to deliver material to people in need in their areas of responsibility. This report analyzes the options available to these commands in seeking humanitarian assistance cargo transportation. The report offers a description of current operations, with a specific focus on the European area of responsibility, where humanitarian assistance cargo transportation programs have had limited activity.

The analysis reaches the following conclusions: (1) currently no transportation program exists that focuses on providing a quality of service to combatant commands' humanitarian assistance transportation needs; (2) legal, fiscal, and operational mechanisms exist and are outlined to create such a program; and (3) exclusively space-available transportation is generally insufficient for providing the quality of service that may be required for relationship-building through humanitarian assistance cargo transportation, and contract shipping may be necessary. These conclusions are placed in the context of current humanitarian assistance operations, and relevant operational considerations are highlighted throughout the document. The analysis is based on both a quantitative model of transportation, as well as detailed conversations with Department of Defense humanitarian assistance personnel throughout key Department of Defense organizations.

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EXECUTIVE SUMMARY

Presidential, national military, individual service, and combatant commander strategic documents all list humanitarian assistance as one of the core goals and responsibilities of the United States armed forces. One part of humanitarian assistance programs is the transportation of nongovernmental organization cargo from the United States to destinations in need. This report analyzes three programs for the transportation of such cargo: the Denton Program, the Funded Transportation Program, and Project Handclasp. The Denton Program and the Funded Transportation Program are employed by the Department of Defense, while Project Handclasp is a Department of the Navy program. All three programs have historically had limited activity to European destinations when compared to other geographic areas of responsibility.

The three programs operate under different legal authorities, funding sources, and operational structures. The Denton Program's legal authority comes from the U.S. Code for the Armed Forces, Title 10, Section 402. It is funded by the Defense Security Cooperation Agency and United States Transportation Command. The Funded Transportation Program's legal authority comes from U.S. Code for the Armed Forces, Title 10, Section 2561, and it is funded by the Overseas Humanitarian Disaster Assistance and Civic Aid appropriation. Project Handclasp operates under a Chief of Naval Operations instruction and is funded by the Navy.

The analysis shows that currently no transportation program exists that focuses on providing a quality of service to combatant commands' humanitarian assistance transportation needs. Both the Denton Program and the Funded Transportation Program are a public service by the Department of Defense to nongovernmental organizations, and are driven by applications to the programs from nonmilitary sources. Project Handclasp is a Navy program, funded by the Navy, with its current focus primarily on Navy missions.

The analysis outlines the legal, fiscal, and operational mechanisms that may be used to create a program that focuses on providing a quality of service to combatant command's humanitarian assistance transportation needs. While several options for lead

executor of such a program exist, the recommended option is utilizing existing facilities by creating a joint role for Project Handclasp. In this way, Project Handclasp can execute a similar mission for combatant commands as it currently does for the Navy, using several new methods of transport. Project Handclasp has been used by combatant commands in the past; however, operational and organizational hurdles must be overcome before it can serve a clearly defined joint role.

Finally, the analysis employs an analytical model of space-available transportation to estimate the shipping capacity to European destinations. The analytical model shows that exclusively space-available transportation is generally insufficient for providing the quality of service that may be required for relationship-building through humanitarian assistance cargo transportation, and that contracted shipping may be necessary. The analytical model further shows only limited improvement of combined space-available transportation and contracting over contracting alone.

I. INTRODUCTION

A. PROBLEM

Nongovernmental organizations (NGOs) from the United States have conducted humanitarian relief operations across the world for years. In the last several years, the military has become increasingly more involved in providing this type of assistance as well. This is evident in the most recent release of the National Military Strategy, which emphasizes the importance of building and strengthening international strategic partnerships (Department of Defense, 2011). In order to support these strategic goals, the Department of Defense (DoD) employs two programs, and the Department of the Navy (DoN) operates and maintains an additional program, to ship NGO-owned humanitarian assistance (HA) cargo to overseas countries in need. The DoD programs are the Denton Program and the Funded Transportation Program, and the DoN program is Project Handclasp. All three programs operate independently of each other through different operational guidelines, funding sources, and legal authorities. However, they all work in conjunction with U.S. government country teams and coordinate through representatives of the United States Agency for International Development (USAID).

In recent years, United States Southern Command (SOUTHCOM) has been very successful in utilizing these programs for cargo delivery to their area of responsibility (AOR). United States European Command (EUCOM), however, has not enjoyed the same amount of success. For example, in 2009, Project Handclasp delivered 750 pallets of HA cargo, weighing nearly 500,000 pounds, to SOUTHCOM AOR, but only one pallet was transported to Europe (United States Navy Project Handclasp, 2009). In the same year, the Funded Transportation Program shipped just two containers of humanitarian aid materials to EUCOM, while SOUTHCOM received 49 (Defense Security Cooperation Agency, 2010). Similarly, in fiscal years 2010 and 2011, the Denton Program transported 1,208,962 pounds of cargo to 13 countries in SOUTHCOM. In the same period, only 7,000 pounds were delivered to one country in EUCOM (Joint Relief International, 2011).

B. SCOPE OF STUDY

The main objective of this study is to understand why EUCOM is underserved by the DoD HA transportation programs. A secondary goal of this research is to outline possible policy changes toward a standardized system that can be used by all combatant commanders in order to deliver humanitarian cargo to intended recipients within their respective AORs. In order to provide context to the study, in Section II of this report we outline the current operational procedures of the three programs and their governing legal authorities. In Section III, we outline possible policy and operational changes to increase shipping capacity of HA material to EUCOM and other combatant commands (COCOMs). Finally, in Section IV, we quantify the benefits of these policy changes and operational changes through an analytical model of HA cargo transportation.

II. OPERATIONAL CONTEXT AND CURRENT PROGRAM OPERATIONS

A. IMPORTANCE OF HUMANITARIAN ASSISTANCE CARGO TRANSPORTATION MISSIONS TO THE DEPARTMENT OF DEFENSE

The 2004 Indian Ocean tsunami was one of the most devastating natural disasters in history, leaving over 200,000 dead and millions homeless in 14 countries. In response, over \$14 billion dollars was donated from nations across the world in what some deem the largest relief effort to date. This natural disaster and subsequent relief efforts changed the scale of HA, and also changed the approaches and views of the United States government and the DoD toward HA programs. Admiral Stavridis, current EUCOM Commander, stressed the following in his recent book, *Partnership for the Americas: Western Hemisphere Strategy and the U.S. Southern Command*:

As shown by DoD's experience in Indonesia after the 2004 tsunami, aid can produce a significant amount of sustained goodwill toward the United States, and particularly toward its military. Putting a face to the U.S. military, especially when the face is that of a doctor performing surgeries, or that of a SeaBees team building a medical center, can only be a force for improving international relations and creating a positive perception of the United States. (2010, p. 142)

Prior to Stavridis' job as Commander of EUCOM, he held the position of SOUTHCOTM Commander. As SOUTHCOTM Commander, in 2006, he initiated several HA missions in South America and the Caribbean. One of the most successful of these operations was Continuing Promise 2007. For this mission, the USNS COMFORT, a hospital ship, conducted medical missions in 12 countries in Latin America and the Caribbean. The exercise was so successful that it was reinitiated the following year with two amphibious ships—one that was deployed to the Pacific and one to the Atlantic. Altogether, the two amphibious ships treated more than 200,000 patients, in several countries, around the world that year.

The United States Pacific Fleet developed a similar annual operation in 2006, called Pacific Partnership. It was designed to provide HA to countries in the

United States Pacific Command (PACOM) region. In 2010, the Pacific Partnership interagency operation included 10 partner nations, 19 NGOs, USAID, and the U.S. Public Health Service. As part of that mission, Project Handclasp distributed over 58 pallets of donated material, worth over \$162,000, to six host nations (L. Franchetti, personal communication, June 30, 2010).

As evidence of the DoD's increasing awareness of the benefits of HA, through missions such as those in South America and the Pacific, the latest National Military Strategy emphasizes the importance of strengthening and building international relations through HA operations:

Humanitarian assistance and disaster relief activities employ the Joint Force to address partner needs and sometimes provide opportunities to build confidence and trust between erstwhile adversaries. They also help us gain and maintain access and relationships that support our broader national interests. (Department of Defense, 2011, p. 17)

In order to achieve these strategic goals, all the COCOMs define the necessary steps to build relations in their respective AORs through their Theater Security Cooperation plans. Specifically for EUCOM, Stavridis' priorities focus on building and strengthening partnerships with European counterparts:

While ensuring [EUCOM] readiness to execute military operations in support of contingency plans, EUCOM will

1. Build partnerships to enhance security, regional stability, and support of global initiatives like ISAF [International Security Assistance Force]
2. Strengthen NATO [North Atlantic Treaty Organization] collective defense and assist its transformation
3. Support operations in Afghanistan and Iraq
4. Counter transnational threats
5. Engage Israel, Russia, and Turkey in areas of mutual interest. (United States European Command, n. d., p. 7)

To accomplish these objectives, EUCOM must be able to partner with NGOs to

effectively use the HA programs to transport NGO-owned cargo to intended recipients.

B. CURRENT DENTON OPERATIONS

The Denton Program (Denton) provides transportation of NGO cargo at no cost to the NGO and is jointly administered by USAID, the Department of State (DoS), and the DoD. The program was originally created by Jeremiah Denton, a Senator from Alabama, as an amendment to the Foreign Assistance Act of 1961. Senator Denton created the program to use space-available to deliver NGO cargo to third-world countries. It was not until 1985, however, that the Denton Program was implemented (Norman, 2011).

Since the Denton Program is a DoD program, it is governed by the U.S. Code (USC) for the Armed Forces, Title 10. Specifically, the legal authority for Denton's operations comes from USC 10, Section 402. The law states that, notwithstanding other provisions of law, "the Secretary of Defense may transport to any country without charge, supplies which have been furnished by a nongovernmental source and which are intended for humanitarian assistance. Such supplies may be transported only on a space available basis" (Transportation of Humanitarian Relief Supplies to Foreign Countries, 2011). Section 402 continues to describe specific requirements that must be met before material can be accepted for shipment. For example, the material must be in suitable condition, adequate arrangements must be made for its distribution in the destination country, and there must be a legitimate humanitarian need for it. Section 402 concludes with a yearly reporting requirement to Congress for any cargo shipped using the legal authority provided.

Since Denton uses strictly space-available on military assets, the costs to the DoD are minimal; however, some funding is necessary to administer and facilitate cargo movement. Much of this work is done by the United States Transportation Command (TRANSCOM) contractor Joint Relief International (JRI). The funding for JRI is covered by TRANSCOM and the Defense Security Cooperation Association (DSCA) (P. Marshall, personal communication, July 7, 2011).

In order to meet each of the requirements in USC 10, Section 402, Denton has a specific operational procedure for NGOs to follow, which is outlined in Chapter 12 of DoD Instruction 5105.38-M. First, the NGO donor contacts USAID and fills out an

online application. USAID then coordinates approval of the application with DoS and DSCA. However, before any material is accepted, the donor must complete the necessary customs paperwork, obtain a duty-free letter, and identify a legitimate consignee of the material in the destination country, as per Section 402, before their application can be approved by the Denton Program. Additionally, the material must be properly packaged and a suitable space-available route from the cargo's origin to its final destination must be identified by the JRI contractor. If no such route exists, the cargo is not accepted because it cannot be transported. The NGO must assume all costs associated with customs, packaging, and cargo delivery to the time and place of embarkation.

Once an application is accepted and a space-available route is identified, the process of moving the cargo can begin. JRI uses the TRANSCOM Single Mobility System (SMS), an online tracking system containing primarily military aircraft data, to find available transportation channels. While SMS has some functionality targeted specifically at Denton, no automated system exists for finding space-available routes. To facilitate a shipment, JRI contractors must manually search possible routes to determine likely space-available channels to the destination. Accepted NGO cargo is classified as Transportation Priority 4 (TP-4) cargo, which is the lowest cargo classification level in terms of priority in the DoD logistics system. JRI is able to track the cargo electronically, using a Transportation Cargo Number (TCN) on the Global Air Transportation Execution System (GATES) and on a system called IDE/GTN Convergence (IGC), which is the convergence of Global Transportation Network (GTN) and Integrated Data Environment (IDE); as well as through personal communications between JRI and personnel at transshipment locations. JRI tracks the cargo until its final destination, where USAID representatives, as well as U.S. military personnel involved with the cargo transportation, coordinate with a prearranged consignee to properly distribute the donations to the intended recipients (K. Hundemer, personal communication, June 28, 2011).

Denton cargo can be shipped quickly on a well-utilized, space-available route once the cargo is accepted. For example, the process typically takes less than a week, and usually no more than two weeks, for cargo travelling through Ramstein Air Force

Base in Germany to its ultimate destination (D. Noe, personal communication, June 2, 2011). However, the application process for cargo acceptance can take time, and material is not always guaranteed to be accepted due to various aforementioned reasons.

At its core, the Denton Program is designed to be a public service offered by the DoD to NGO donors, who drive the Denton Program process through their initial applications. Although the donors must cover some incurring costs and complete the required paperwork prior to material acceptance, the program offers the NGO donors a benefit by providing transportation at no cost. The Denton Program realizes this, so, in order to avoid being inundated with requests from a single NGO, they have implemented policies to be fair to all NGOs. For example, the program will typically accept only one shipment per NGO at a time.

Legally, the Denton Program can use space-available pallet positions on any military asset for transportation. However, the Navy and other services do not use SMS for tracking, so Denton has limited visibility of Navy shipping and of space-available on aircraft other than that of the Air Force. As a result, Denton only uses Air Force channel, contingency, and Special Assignment Airlift Mission (SAAM) flights for space-available cargo transportation.

There are several reasons for the limited use of the Denton Program in the EUCOM AOR, compared to other AORs. One reason is that shipment applications are initiated by NGOs. Without NGO applications with a European destination, no material can be delivered to Europe. The lack of applications for European destinations is due to several factors. First, NGOs often donate material in response to perceived high poverty levels or a natural disaster, such as the earthquake that devastated Haiti in 2010. Thus, a large number of NGOs apply for transportation to the SOUTHCOR or PACOM AORs because of their countries' high susceptibility to these types of disasters and their perceived poverty levels. Second, SOUTHCOR and CENTCOM have a much higher frequency of inbound DoD transportation assets than EUCOM, due to the proximity of SOUTHCOR to the U.S. and the high number of contingency missions flying to CENTCOM to support the war efforts. As a result, NGOs take advantage of these opportunities and apply for delivery to countries within the aforementioned AORs instead

of to EUCOM, where the main countries of interest have a much lower frequency of available DoD transportation channels. A Denton application for transportation to these remote European locations may be rejected because potential suitable delivery routes cannot be found. The drawdown of operations in Iraq and Afghanistan will further reduce the number of space-available pallet positions to European destinations because, typically, Denton cargo transported to Europe utilizes contingency missions that are maintained in order to support the efforts in Iraq and Afghanistan.

A final limiting factor to Denton operations is staffing. Although JRI utilizes computer systems, such as SMS, to identify available routes, cargo delivery and mission success are ultimately reliant on person-to-person coordination and networking in order to find space available in a timely fashion. The process is by no means automated. Additionally, verifying NGO requests, finding space-available routes, and tracking shipments can be a labor-intensive process that is often limited not necessarily by lack of space-available transportation, but rather by a limited amount of manpower. As a result, if difficult-to-identify-and-administer, space-available routes do exist, they may go unutilized.

C. CURRENT FUNDED TRANSPORTATION OPERATIONS

The Funded Transportation Program (FTP) also provides transportation for NGO-owned cargo at no cost to the NGO. FTP is administered by DSCA, and the program derives its legal authority through USC 10, Section 2561. The section states “funds authorized to be appropriated to the Department of Defense for . . . humanitarian assistance shall be used for the purpose of providing transportation of humanitarian relief and for other humanitarian purposes worldwide” (Humanitarian Assistance, 2011). It concludes with an explanation of the annual reporting requirement to Congress for any funds that are used for humanitarian relief and humanitarian cargo transportation missions funded by the DoD.

Funds for FTP and several other programs are provided yearly by the Overseas Humanitarian Disaster Assistance and Civic Aid (OHDACA) appropriation. FTP receives a variable amount each year that usually totals approximately \$1.5 million dollars to be used for all FTP transportation worldwide.

Operationally, FTP is similar to the Denton Program. In both cases, the process is initiated by an NGO submitting an application. In the case of FTP, the application is handled by DSCA. The NGO application and cargo for FTP have the same requirements as Denton: the cargo must have a legitimate humanitarian purpose, it must be packaged properly, customs paperwork with a duty-free letter must be completed, and a consignee of the material in the destination country must be identified and verified before the application is approved (Funded Transportation Program, 2011). Because FTP purchases transportation for the cargo from outside contractors, route identification is not a necessary step. The funds required for transporting a specific NGO request can be estimated using the TRANSCOM SMS. Applications are accepted on a first-come, first-served basis until the yearly funding is exhausted.

At its core, FTP is essentially an extension of the Denton Program, intended to reach destinations that are not accessible to space-available transportation assets. Similarly to the Denton Program, FTP is a public service by the DoD to NGOs. In the past, the two programs have been administered by DSCA, which accounts for their similar operational requirements. NGOs also drive the FTP process through their initial applications, as is the case with Denton.

FTP derives its authority from USC 10, Section 2561; however, it is not the only expression of that authority. Section 2561 allows DoD to use correct appropriations for humanitarian purposes, but does not contain the explicit requirements of Section 402, the Denton amendment. Thus, it is possible for other programs to exist under Section 2561 that do not explicitly follow the Denton model of transport. In particular, Section 2561 does allow for HA programs that are not driven by an NGO request for transportation to a predetermined consignee.

FTP's underutilization in EUCOM, as compared to other AORs, is a result of several factors. First, similar to Denton, if no NGO applications requesting shipment to European destinations are submitted, then no material is transported to EUCOM by FTP. Second, because FTP is a public service to NGOs and operates on a first-come, first-served basis; delivery locations are a result of NGO requests, and there is no expectation of an even distribution of HA material among AORs. Third, for destinations in former

Soviet republics of Eastern Europe, the DoS funds a similar program administered through Counterpart International that services some NGO demand for Europe (Counterpart International, 2012). Finally, FTP is limited by funding appropriated by Congress. Once the funding for the fiscal year is exhausted, the program cannot make further shipments.

D. CURRENT PROJECT HANDCLASP OPERATIONS

Project Handclasp (PH) is a Department of the Navy (DoN) program, implemented by the Chief of Naval Operations (CNO) in 1962 to support Navy humanitarian missions. PH is governed by a CNO instruction that outlines its mission and operational goals. Its primary purpose is to enhance the perceptions of the United States and the U.S. Navy through direct, person-to-person contact between U.S. Navy and Marine Corps personnel and people overseas. PH may also arrange for space-available transportation of NGO material to consigned recipients overseas, as long as that material fits into the categories outlined in the instruction. PH falls under the direction and strategic guidance of the Office of the Chief of Naval Operations for Operations Plans and Strategy (OPNAV N3N5) International Engagement Division (OPNAV N52). OPNAV N52 is the program sponsor and is responsible for the PH instruction. Consequently, PH provides quarterly reports to OPNAV N52 measuring program performance and providing updates on administration, expenses, and manning.

Since PH is a DoN program executing a Navy mission, its operations are funded by the Navy. In recent years, some COCOMs have assigned their personnel to assist PH in enhancing its ability to deliver material to the COCOMs' AORs. For instance, SOUTHCOM previously sent an officer to focus PH efforts on SOUTHCOM, and an officer from EUCOM is currently at PH to do the same for the EUCOM AOR.

The operations of PH are facilitated by two separate legal entities. The first is the Navy Project Handclasp (Navy PH) and the second is a nonprofit, NGO called the Project Handclasp Foundation, Inc. (PHF). The PH transportation process begins with a donation to PHF from a corporation, a public service organization, or an individual. PHF assumes legal title of the material once it is donated. While legal title to the material is

held by PHF, Navy PH is operationally in charge of receiving, collecting, inspecting, consolidating, storing, and transporting the donated material.

Donated material falls under two distinct categories: consigned or unconsigned. Consigned donations have a particular recipient or geographic area targeted by the donor. According to the PH instruction, consigned material is only accepted if the donor's objectives contribute to the overall mission of Navy PH (Office of the Chief of Naval Operations, 2006). For consigned material, Navy PH provides transportation strictly on a space-available basis and the donor arranges for distribution to the identified consignee. In contrast, unconsigned donations are essentially goodwill material that can be used at the discretion of Navy PH.

PH receives donations and is able to store them in a warehouse in San Diego with capacity for approximately 3,000 Navy pallets. Following the CNO instruction, the material is properly inspected and often repackaged to meet transportation requirements. The material is then stored in the warehouse until an appropriate Navy mission is identified for the material's overseas distribution. To identify destinations for unconsigned material, Navy Component Commanders (NCCs) communicate their HA needs to Navy PH, and Navy PH arranges for transportation and distribution as necessary. Throughout the entire process for both consigned and unconsigned material, PHF maintains the legal title to the donations; the Navy never legally owns donated material.

Navy PH does not use a centralized system, such as SMS, to find space-available transportation. Rather, they have access to Navy schedules through direct contact with fleet commanders. Navy PH also tracks shipments through direct communication with ships' crews. Recently, PH has been part of a number of Navy missions, including Continuing Promise and Pacific Partnership. In addition to the warehouse in San Diego, PH has access to several forward-deployed staging areas that can store 20 to 100 pallets. These staging areas are typically used to hold supplies for unforeseen disaster relief operations. Occasionally, as a secondary mission, they can be used for short-term storage to facilitate transportation. One such staging area is located in the EUCOM AOR in

Rota, Spain. Others are located in Pearl Harbor; Norfolk; Mayport; Singapore; and Yokosuka, Japan.

At its core, PH is a Navy program, funded by the Navy, executing a Navy mission. As such, PH only has the authority to use Navy space-available assets. PH's transportation ability is limited by ship schedules, which are often unreliable and much more infrequent than the Air Force aircraft routes used by Denton. The program is also labor-intensive and limitations are not necessarily the result of a deficiency of space-available opportunities, but rather a limit on the manpower that is necessary to maintain private partner relationships and take advantage of transportation opportunities.

PH contrasts with the other two programs in one key area. Both Denton and FTP are a public service by the DoD, driven by NGO requests for transportation; whereas PH is driven by Navy mission requirements to improve perception of the U.S. Navy overseas. As an explicit example, PH can receive unconsigned donations and distribute them based on NCC requirements. Once transported, the unconsigned PH material is ultimately distributed to the recipient by uniformed Navy or Marine Corps personnel.

PH's distribution of HA material in the EUCOM AOR has been limited. The main reason is PH's inability to use anything other than Navy assets, particularly space available on ships. The countries to which EUCOM strives to provide HA typically do not have regularly scheduled ship port visits. Thus, the opportunities for PH to schedule cargo deliveries are infrequent. EUCOM is also at a disadvantage because scheduled humanitarian missions, such as Pacific Partnership and Continuing Promise, do not occur in their AOR. These operations carry large amounts of PH material—for example, in 2009, the Continuing Promise mission accounted for 425 pallets of SOUTHCOM's total 750 PH pallets. Such missions historically have not occurred in EUCOM because these types of operations are often initiated in response to a natural disaster, in the case of Pacific Partnership, or to aid developing countries, as with Continuing Promise. Europe typically does not have the same disaster-related and economic challenges faced by countries within the SOUTHCOM and PACOM regions. However, strategically, building and maintaining relationships is as important in Europe as it is in other regions of the world.

Finally, a critical component of having effective HA transportation programs is to deliver cargo that satisfies a need at the destination. EUCOM has been at the forefront of initiating a *pull* transportation system, where cargo is only shipped if it satisfies an identified requirement at the destination, as opposed to a *push* transportation system, where cargo is shipped if it is available and the channel exists. Cargo pushed through the transportation system increases raw pallet numbers, but it often decreases the effectiveness and image of HA transportation programs because it goes unused after arriving at its destination. Denton and FTP address this issue by requiring a predetermined consignee to the material. In its current operational model, PH shipments are in response to NCC requests.

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III. OPTIONS FOR INCREASING HUMANITARIAN SHIPPING CAPACITY TO UNITED STATES EUROPEAN COMAMND

A. UNITED STATES EUROPEAN COMMAND STRATEGIC IMPORTANCE

EUCOM would like to partner with NGOs and use deliveries of NGO-owned material to build and maintain strategic relationships within their AOR. Delivery of HA material and direct involvement by DoD personnel improves perception of the DoD and its mission. The effects of these donations remain long after the material is distributed, helping to build long-lasting partnerships with foreign nations. By providing the mechanism for HA cargo delivery to countries in need, EUCOM is able to make steps toward regional security and stability, which consequently impacts the support our partners provide toward our global initiatives (United States European Command, n. d.).

B. EXECUTOR OF COMBATANT COMMAND'S HUMANITARIAN ASSISTANCE CARGO TRANSPORTATION, PARTNERSHIP-BUILDING MISSION

The current guidance from the U.S. Secretary of Defense to the COCOM HA staffs lists Denton and the Funded Transportation Programs as the methods for transporting HA material to a destination in need (United States Secretary of Defense, 2009). Operationally, these two programs are not focused to address the COCOM relationship-building mission. The programs are a public service by the DoD and are driven by NGO requests instead of COCOM priorities. Currently, there is no lead executor for HA cargo transportation that focuses on the COCOM relationship-building missions, requirements, and priorities. Table 1 provides a short summary of options for addressing this deficiency. For the remainder of this section, we discuss some of these options in greater detail.

Table 1. Summary of options for addressing COCOM HA cargo transportation strategic relationship-building mission. Currently, no agency focuses on COCOM priorities for HA cargo transportation.

Option Summary	Discussion	Recommended?
1. Do nothing.	Provides no quality of service for COCOM HA missions. COCOMs may encourage and assist NGO applications for Denton and FTP. COCOMs may ask for assistance to task PH through NCCs.	No
2. Realign Denton/FTP to focus on COCOM missions.	Removes well-utilized and liked DoD programs. Negatively impacts relationships with NGOs and partners. Removes the beneficial impact of existing programs.	No
3. Give joint role to PH.	Builds on PH relationships with NGO partners and PH experience, expanding the program to non-Navy assets. Requires COCOM funding to execute COCOM mission. Requires adjustment and expansion of PH operations.	Yes
4. Create common execution of transportation between Denton, FTP, and PH.	Misapplies Denton and FTP to satisfy COCOM relationship-building mission. Has previously been attempted with little success. Provides no quality of service guarantee to COCOMs.	No
5. Create new program as lead executor.	Does not make use of existing expertise and capabilities in current HA cargo transportation programs.	No
6. Create multiple programs: for each service or for each COCOM.	Leads to confusion on the part of NGOs willing to assist. Significantly complicates congressional reporting requirements.	No

The three HA transportation programs differ in their ability to execute the EUCOM partnership-building mission. Both the Denton and the Funded Transportation Programs operate similarly as a public service provided by the DoD. The Denton Program's purpose, legally and operationally, is to facilitate NGO-owned cargo transport for NGOs. The program is driven by NGO requests and, as such, using it to satisfy COCOM theater strategy would be a misapplication of the program. The program may be suitable for occasional requests by NGOs that happen to coincide with COCOM

strategy, but no regular service for COCOMs can be expected. Because FTP has a similar purpose and operation as the Denton Program, similar reasoning shows that it also is not ideal for executing COCOM HA missions.

One explored method of executing COCOM HA cargo transportation operations is using PHF as the acting NGO for Denton and FTP applications. Theoretically, such an approach would provide the PH process with multimodal transportation by giving it access to space available on Air Force planes through Denton and some funding from FTP. A SOUTHCOM Naval officer who worked with PH submitted applications on behalf of PHF to both Denton and FTP. These applications were unsuccessful for several reasons. First, the legal authority of the Denton Program requires that the source of the transportation request be an NGO. Initially, because of the normal procedural validations of Denton and FTP applications, care had to be taken to ensure that PHF satisfied the legal definition of an NGO. After PHF was confirmed as a legitimate private sector organization, it could use the two programs. However, both Denton and FTP have the policy that no special treatment can be given to any one NGO over others. Thus, under this model, no quality-of-service guarantees can be made on PH's ability to use multimodal transportation. More importantly, this operational model is a misapplication of the Denton and Funded Transportation Programs because it attempts to use them to fulfill COCOM missions instead of their intended purpose—to provide a service to NGOs.

In contrast with Denton and FTP, PH is designed to be a mission-oriented program whose main purpose is to satisfy Navy strategic objectives by increasing perceptions of the U.S. Navy abroad. COCOM HA missions satisfy similar theaterwide strategic objectives. The expertise and experience of PH could be used to achieve a similar mission for COCOMs as it does for the Navy: to improve perception of the United States military through the delivery of HA material. However, a number of operational changes would have to occur to facilitate such an expansion of the operations of PH.

C. METHODS OF CREATING A JOINT ROLE FOR PROJECT HANDCLASP

Currently, PH is tasked and funded by the Navy to satisfy Navy mission objectives, and is limited to using Navy assets. To satisfy COCOM HA cargo transportation missions, PH would require a joint role that elevates its operations from satisfying solely Navy objectives to a standard service available to combatant commanders to satisfy COCOM HA cargo transport mission requirements. A general legal and financial outline of achieving this change in PH's operations consists of the following steps:

1. A COCOM incorporates the need to maintain and build relationships with countries in their AOR through Phase 0 programs—including the timely delivery of HA cargo—in their Theater Security Cooperation strategy and approved operational plans.
2. A COCOM has the authority to organize the services to achieve its approved operational plans (Department of Defense, 2008). This allows a COCOM to organize the services to support PH in accessing the DoD's logistic capabilities.
3. A service, however, does not resource its forces to support COCOM objectives. Thus, a COCOM may also provide funding to achieve its approved, Phase 0, HA cargo transport objectives through its regular mission-funding routes. Such a funding step would enable PH to access both outside contractor transport and space-available, low-priority DoD transport, increasing its logistic capabilities beyond the use of only Navy assets.
4. Any DoD funding used for transportation of HA cargo falls under USC 10, Section 2561—the same authority used by FTP—and has the same requirements, such as annual reporting to Congress.

In order for the COCOMs to achieve their strategic relationship-building objectives, the process for transporting HA cargo should be standardized, with a predictable quality of service. Through the steps outlined above, a COCOM identifies

this as a mission requirement, and funds it through its regular mission-funding pathways; for example, its OHDACA funds. It grants PH the ability to place cargo onto non-Navy and outside contractor assets for transportation of material that achieves the COCOM mission.

Operationally, a joint role for PH would allow for direct tasking of PH by COCOM HA staff. The current PH tasking by NCCs, combined with a lack of communication between NCCs and COCOMs, can lead to COCOM misperception of PH shipments as *push* shipments, even for deliveries initiated by NCC requests. Moreover, NCCs do not have dedicated staff for HA missions, as do COCOMs. Thus, direct tasking of PH by COCOM HA staff would increase transparency of shipments and improve the responsiveness of PH to COCOM theater objectives.

Direct tasking could be performed in the following manner. A COCOM could work with their local USAID representatives and the country teams to coordinate a priority list of material that would help with partnership-building. Such a priority list could be published and given regularly to PH to match these requests with donated materials in the PH inventory. Once material is identified, the COCOM HA staff, in conjunction with the recipient country team, could obtain the necessary duty-free and customs paperwork from the recipient country, and transportation could be executed by PH. Direct tasking by the COCOM HA staff would reinforce a pull transportation system for procuring needed material to the COCOM AOR vice pushing HA donations that recipient countries may or may not need. Because COCOMs would resource PH's joint role, the performance of PH could be measured not by pallets or total weight, but by the number of shipments that satisfy a COCOM's HA priorities.

Even with a joint role, PH would continue to execute its Navy mission. PH is well-positioned within the Navy's logistic organizations, and has good administrative support. Thus, it would be inadvisable to move PH to a different organization. Instead, the Navy could be designated as the executive agent for COCOM HA cargo transportation requirements and PH could provide transparency and work with DSCA to prepare the annual reports to Congress. Creating a joint role for PH could pose relatively

little administrative and operational effort and only a few policy changes, but would require high-level tasking from COCOMs, Navy commanders, and DoD HA officials.

Throughout the process, care must be taken on several legal requirements. First, at no point should donations be solicited from outside agencies. Second, cargo transported through HA transportation programs should satisfy a legitimate humanitarian need. Third, congressional reporting requirements for use of HA funding and transportation should be observed.

IV. QUANTITATIVE MODEL AND RESULTS

In this section, we present a quantitative model used to analyze the transportation capacity of several logistic network options for varying transportation scenarios. The model allows us to quantify the benefits of multimodal HA cargo transportation versus using a single mode of transportation. The model also allows us to gauge the relative ability and cost of HA cargo transportation to reach different destination countries in EUCOM.

A. MODEL

In order to simulate the flow of HA cargo to the EUCOM AOR, we design a network model consisting of nodes and edges. The *nodes* in the model are locations; including military bases in the continental United States that serve as points of origin for the cargo, transshipment nodes in Europe and other parts of the world, and destination nodes that represent the countries that are recipients of the donated cargo. The *edges* in the model represent existing transportation channels, including Navy ship and air routes, Air Force air routes, and contract shipping channels, that can move cargo from one node to another. The data associated with each edge is the respective mode of transportation, its cost, and an associated *capacity distribution*. The capacity distribution is a description of the variability of space available in the channel and is derived from the frequency and type of vessels that travel that route. For example, if 80% of the time there is no vessel moving across the channel, and the remaining 20% of the time there is a vessel with two space-available pallet positions, the capacity distribution would be $[(0, 0.8), (2, 0.2)]$. For the remainder of this section, when we refer to *pallets*, we are referencing standard Air Force pallets, the size of which is equivalent to approximately four Navy pallets.

The data used for the model is obtained from SMS data on flight missions, Sixth Fleet (C6F) data on ship port visits in Europe, Navy Air Logistics Office (NALO) data on Navy air assets in EUCOM, and U.S. Army Military Surface Deployment and Distribution Command (SDDC) data on contracting costs. The data used to create the model for the EUCOM AOR includes 47,324 flight legs obtained from SMS; 1,685 port

visits by 115 ships obtained from C6F; 2,519 flight legs obtained from NALO; and 715 contract cost estimates obtained from SDDC for shipping in and between the United States and the EUCOM AOR. The data reflects movement in EUCOM for the last two to five years. The model consists of 124 nodes in North America and Europe. Nodes in the model are identified from SMS and C6F data. For example, bases that appear frequently in SMS data or C6F data are included in the model, though we confined our analysis to locations within the vicinity of the United States and EUCOM AOR.

We use the data from SMS, Sixth Fleet, and NALO to derive the capacity distributions associated with each edge. We break up the data into two-week time periods and count the number and types of vessels that travel the channel in each two-week time span. We use two weeks as our designated time span because this is the maximum amount of time that Denton cargo will typically be stored at any given intermediary location. Additionally, we estimate the space available on each type of vessel based on operational experience and knowledge of individuals working in organizations with involvement in space-available transportation. In this way, we compute a capacity distribution for each edge. Cost data associated with edges that represent contract transportation is obtained from SDDC data. Transportation Priority 4 rates for Air Force transport are obtained from Air Mobility Command.

B. RESULTS

Figures 1 through 4 show the network and all available channels for both sea lanes and air routes originating in the continental United States (CONUS) and arriving in 1 of the 17 destinations to which EUCOM provides HA.

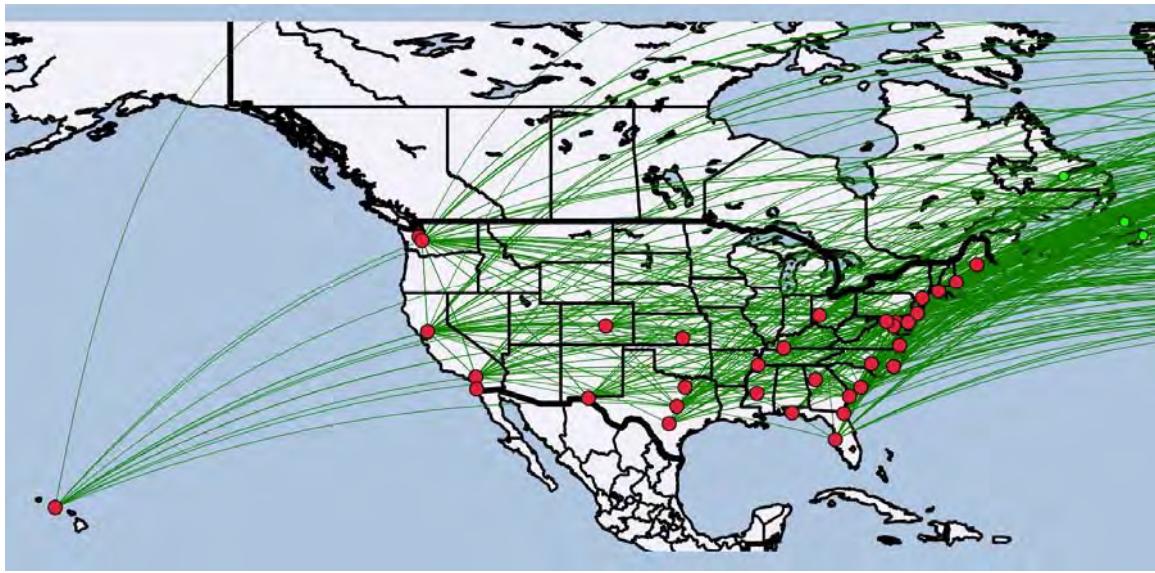


Figure 1. A map of all Air Force aircraft routes in the model originating from the United States. Red dots represent possible cargo origins, green dots represent transshipment locations, and the green edges represent an aircraft route identified from SMS data.

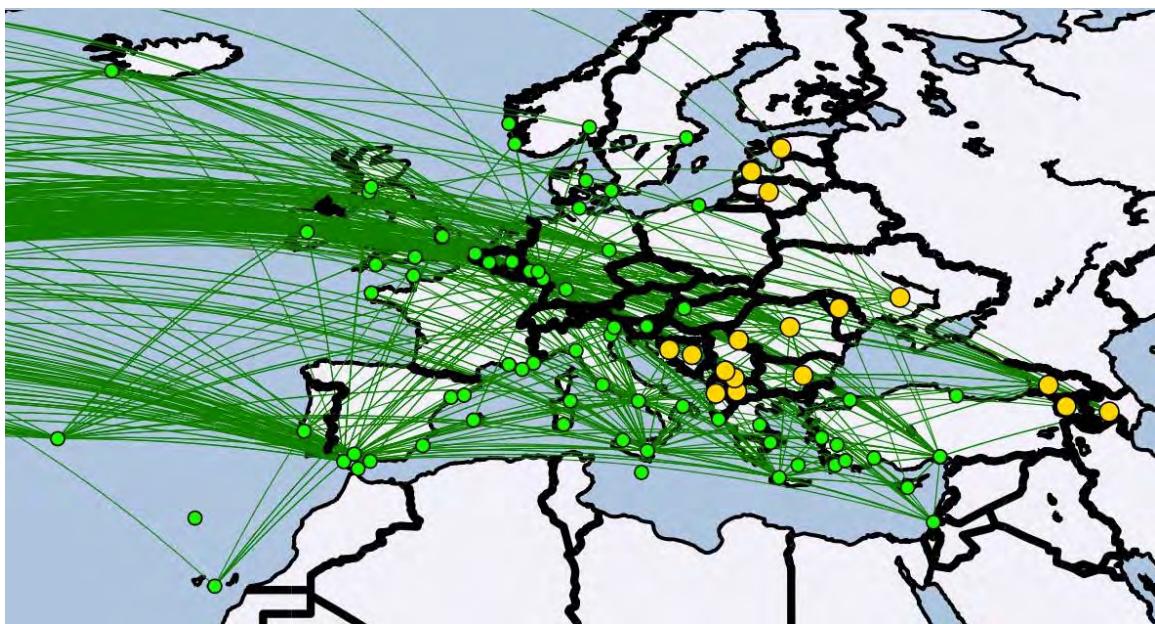


Figure 2. A map of all Air Force aircraft routes in the model arriving in Europe. Green dots represent transshipment locations, yellow dots represent destination nodes, and the green edges represent aircraft routes identified from SMS data.

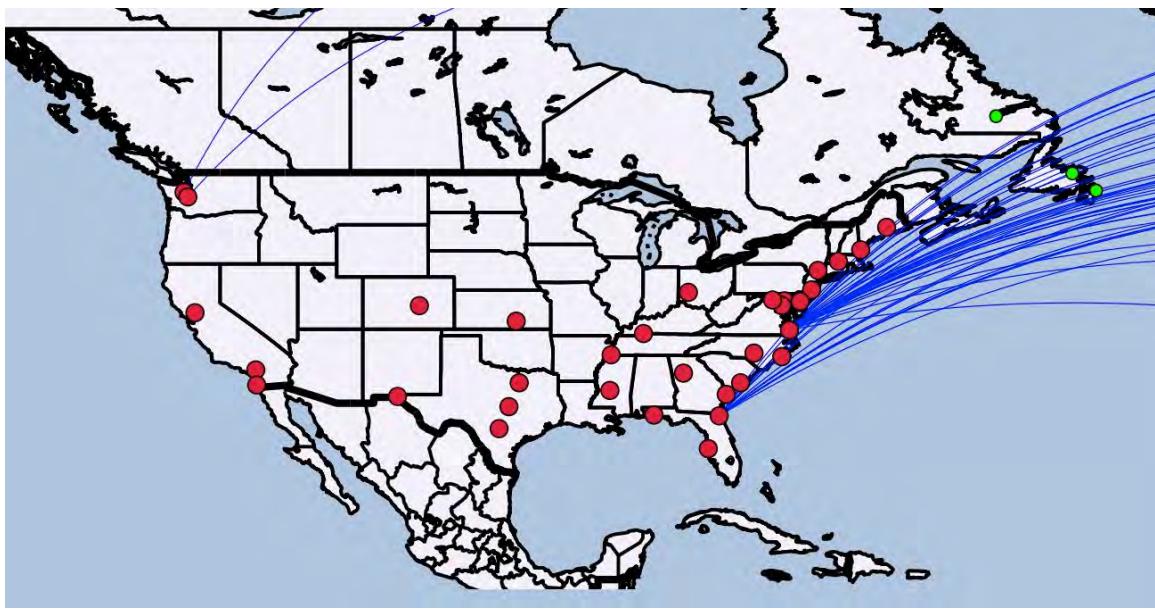


Figure 3. A map of all Navy routes in the model originating from the United States. Red dots represent cargo origins, green dots represent transshipment nodes, and blue edges represent routes identified from Sixth Fleet or NALO data.

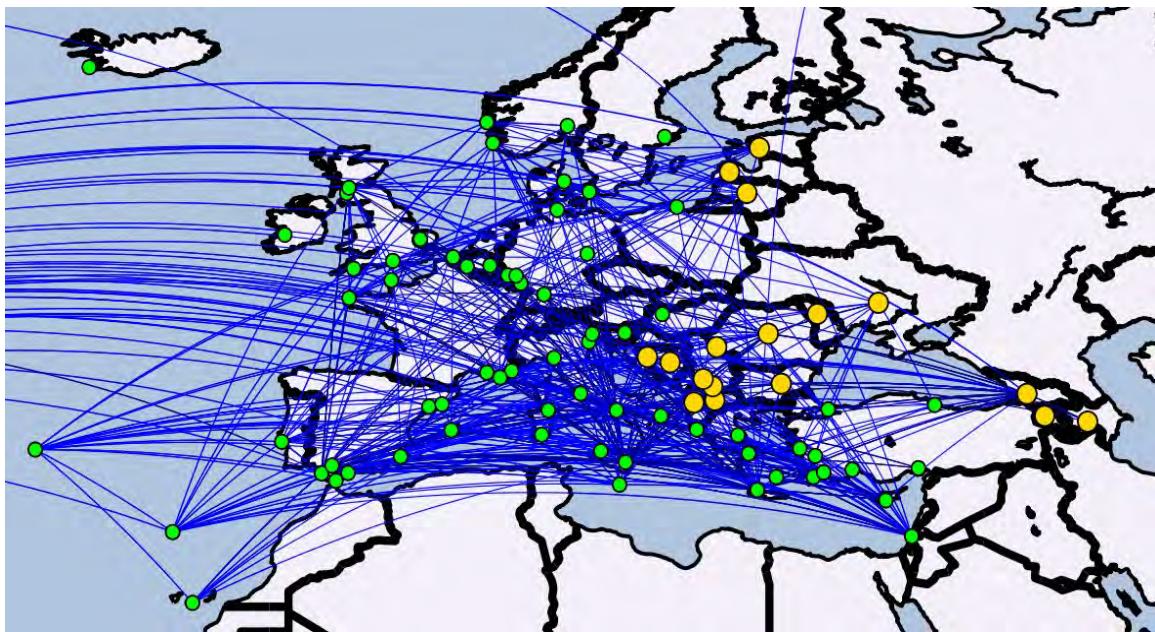


Figure 4. A map of all Navy routes in the model arriving in Europe. Green dots represent transshipment nodes, yellow dots represent destination nodes, and blue edges represent routes identified from Sixth Fleet or NALO data.

We divide the available logistic channels into three categories—Navy channels including Navy ships and NALO flights, Air Force aircraft channels, and contract channels—and create a logistic model for each kind of transportation. A Navy channel-only network models transportation that only uses space available on Navy assets. An Air Force channel-only network models transportation that only uses space available on Air Force aircraft. A contract channel-only network models cargo movement using only contracted transportation. Finally, we create a fourth network that models combined operations of all three modes of transportation.

We analyze several logistic scenarios. For each of the four networks, we analyze the network’s ability to move cargo from the United States to each of the 17 countries of interest in the EUCOM AOR, for a total of 64 scenarios. In each scenario, the cargo is allowed to originate in any part of the United States, must use only transportation edges allowed in the scenario, and must be delivered to the destination country of the scenario.

Figure 5 visually depicts one such scenario, transporting cargo to Montenegro using only space available on Air Force aircraft. For this scenario, the model shows that, on average, space available on Air Force aircraft is able to support approximately 0.45 pallets per two-week time period. This is an average shipment amount per unit time, and operationally translates into the ability to ship a single pallet about every month and a half. The model also identifies the legs from McGuire to Ramstein, Dover to Ramstein, Bangor International to Ramstein, and Ramstein to Montenegro as the essential channels for delivering this cargo. These results reflect a 100% utilization of space-available routes if they exist. In reality, human operators may not be able to achieve such utilization rates, and thus the numbers indicate an upper-bound on performance. The upper-bounds are informative, and later in this section we compare results from lower utilization rates with these optimistic upper-bounds. Unless otherwise specified, the numbers for space-available logistic networks in this section reflect full utilization.

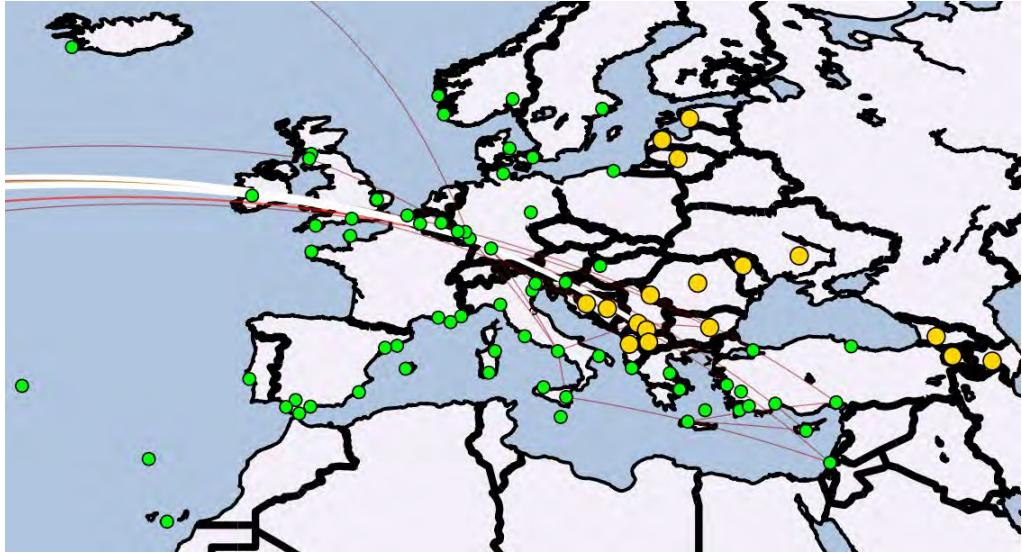


Figure 5. Scenario of transporting cargo to Montenegro using only space available on Air Force aircraft. Yellow dots represent possible cargo destinations and green dots represent possible transshipment locations. The edge colors and thicknesses represent the relative usage of those shipping routes. Thicker, brighter edges make for relatively better, more reliable routes to Montenegro. Thinner, darker edges also make for routes to Montenegro, but of poorer quality. No edges are drawn when no route exists.

Table 2 lists the performance of various logistic networks for four hypothetical HA transportation instances. The four instances were derived from discussions with the HA transportation programs and are based on likely availability of cargo and EUCOM HA requirements. The instances include: (1) shipping two pallets of school supplies from San Diego to Albania; (2) shipping two pallets of water filters from San Diego to Bosnia; (3) shipping an x-ray machine approximately two pallets in size from San Diego to Croatia; and (4) shipping two pallets of school supplies starting from Campbell Air Force Base (AFB) to Azerbaijan. The results assume a 2-4 week lag time for contractors to execute shipments. For a combined operation, if a space-available transportation leg that decreases total costs exists, it is combined with contracting to limit costs. The results in Table 2 indicate that using only space-available transportation networks is insufficient for transporting COCOM HA cargo. In addition, the comparison of the contract network versus the combined operation network indicates that combined operation of space available plus contracting offers little benefit over contracting alone.

Table 2. Performance of four logistic networks against four hypothetical HA transportation instances. The results indicate that exclusively space-available networks (Navy and Air Force) are insufficient to transport HA material in a timely manner. In addition, a combined operation offers limited advantages over pure contracting. Estimated transportation costs are rounded to the nearest one hundred dollars. The designation “N/A” stands for “not available” and means that transport using this logistic network is not possible because a feasible route is highly unlikely. The exclusively space-available networks (Navy and Air Force) can have slightly improved performance if any origin from CONUS can be used to initiate space-available transport. The expected wait times to EUCOM destinations, if any CONUS origin can be used, are depicted in Figures 6 and 7.

Origin	Destination	Material	Logistic Network	Wait (weeks)	Transport Cost (dollars)
San Diego	Albania	Two pallets of school supplies	Navy	N/A	N/A
			Air Force	N/A	N/A
			Contract	2-4	5,000
			Combined	2-4	5,000
San Diego	Bosnia	Two pallets of water filters	Navy	N/A	N/A
			Air Force	N/A	N/A
			Contract	2-4	5,600
			Combined	2-4	5,600
San Diego	Croatia	One x-ray machine, about two pallets in size	Navy	N/A	N/A
			Air Force	N/A	N/A
			Contract	2-4	5,000
			Combined	2-4	5,000
Campbell AFB	Azerbaijan	Two pallets of school supplies	Navy	N/A	N/A
			Air Force	66	0
			Contract	2-4	6,300
			Combined	2-4	6,200

The model yields expected wait times in weeks for Air Force space-available and Navy space-available transportation to the 17 destination countries. Figure 6 shows the expected wait times for Air Force space-available transportation and Figure 7 shows the expected wait times for Navy space-available transportation. These wait times contrast with the transportation instances in Table 2 because the cargo is assumed to originate in any CONUS location where a route is available; for example, through CONUS trucking. Of the 17 countries, only five exhibit wait times of less than a year for Air Force space-available transportation: Romania, Montenegro, Bulgaria, Azerbaijan, and

Georgia. The low wait times for Azerbaijan and Georgia are likely the result of operations in Afghanistan and would change as those operations draw down. In the case of Navy space-available transportation, the performance is similar. Only five countries, Bulgaria, Montenegro, Romania, Croatia, and Georgia exhibit wait times of less than a year. Combining these results, even under the optimistic assumption of full utilization of space-available routes, currently no military space-available transportation channels exist to 11 of the 17 EUCOM destinations of interest.

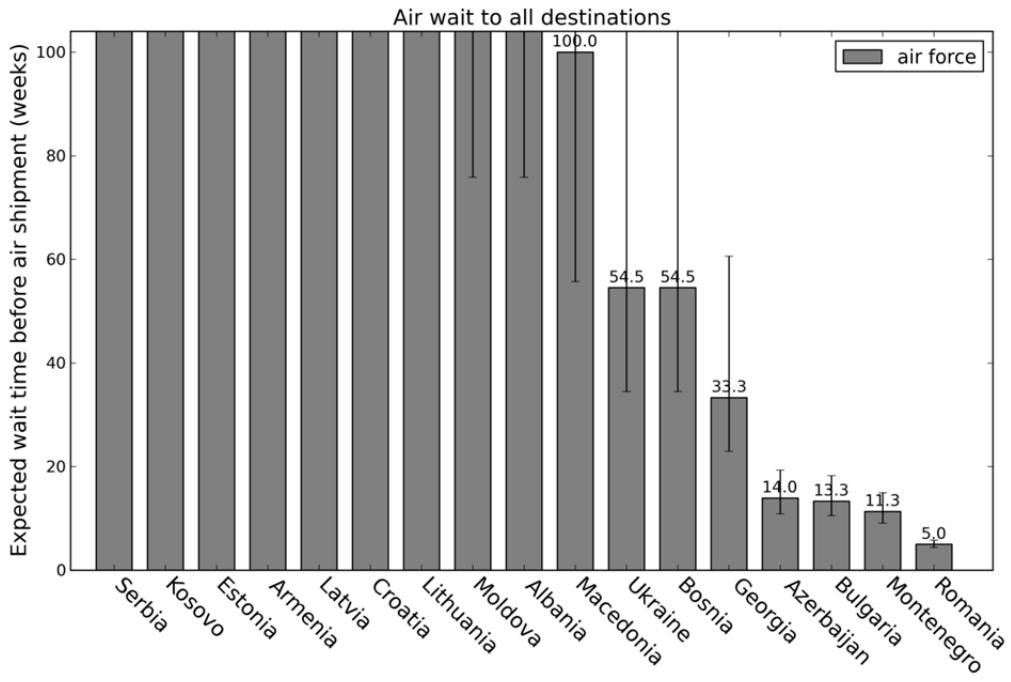


Figure 6. A bar graph of expected wait time for air space-available cargo transportation, in weeks, by destination country. The vertical lines above the bars represent a 95% confidence interval. These wait times assume that cargo can originate in any CONUS origin, if a space-available route from that origin exists. The wait times also assume an optimistic 100% utilization of space-available routes. Even under such optimistic assumptions, only 5 of 17 EUCOM destinations exhibit wait times of less than one year.

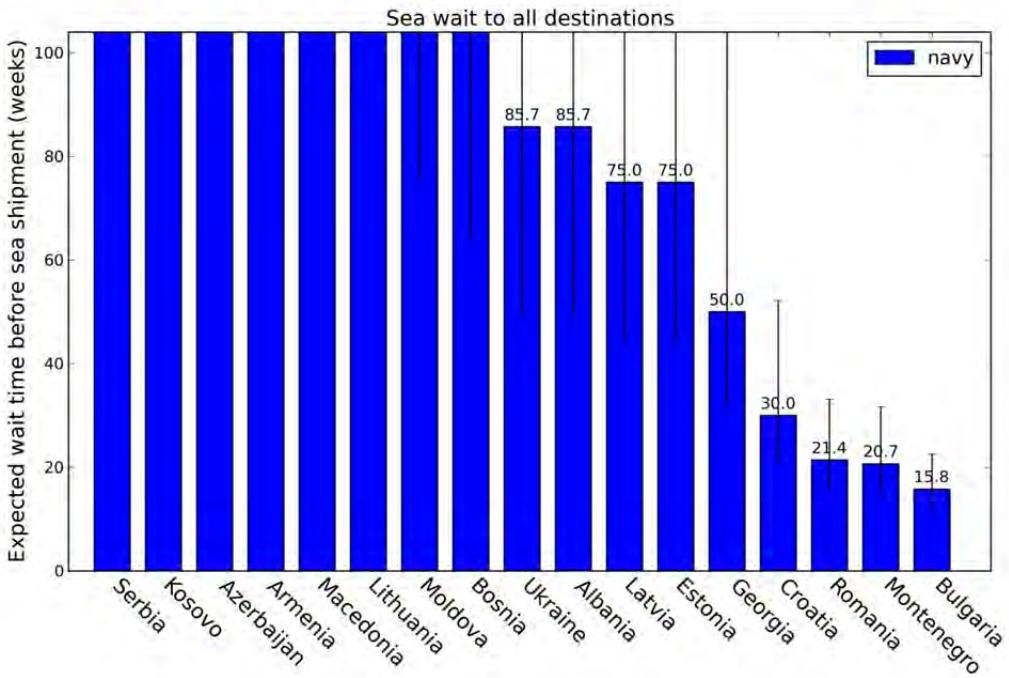


Figure 7. A bar graph of expected wait time for Navy space-available cargo transportation, in weeks, by destination country. This network includes Navy shipping and NALO flights. The vertical lines above the bars represent 95% confidence intervals. These wait times assume that cargo can originate in any CONUS origin, if a space-available route from that origin exists, as well as an optimistic 100% utilization of space-available routes. Even under such optimistic assumptions, only 5 of 17 EUCOM destinations exhibit wait times of less than one year.

Figure 8 depicts the three best and three worst destinations in terms of transportation capability of the combined logistic network. The three best destinations are Latvia, Lithuania, and Estonia. The three worst destinations are Georgia, Armenia, and Azerbaijan. The figure also depicts the performance of each of the four logistic networks, for each of these six country destinations. As exhibited by the preceding results, in general, the space-available networks have very little or no transportation capacity. The contract network and the combined network have roughly the same capacity for each destination because combined operations rely on contractors for the most part, substituting with space-available when possible. The best and worst destinations differ largely by the estimated contracting cost for shipping a pallet to the

destination. The combined network, because it can combine space available and contracting, is always the logistic network with the highest transportation capacity; however, it offers relatively little benefit over contracting alone.

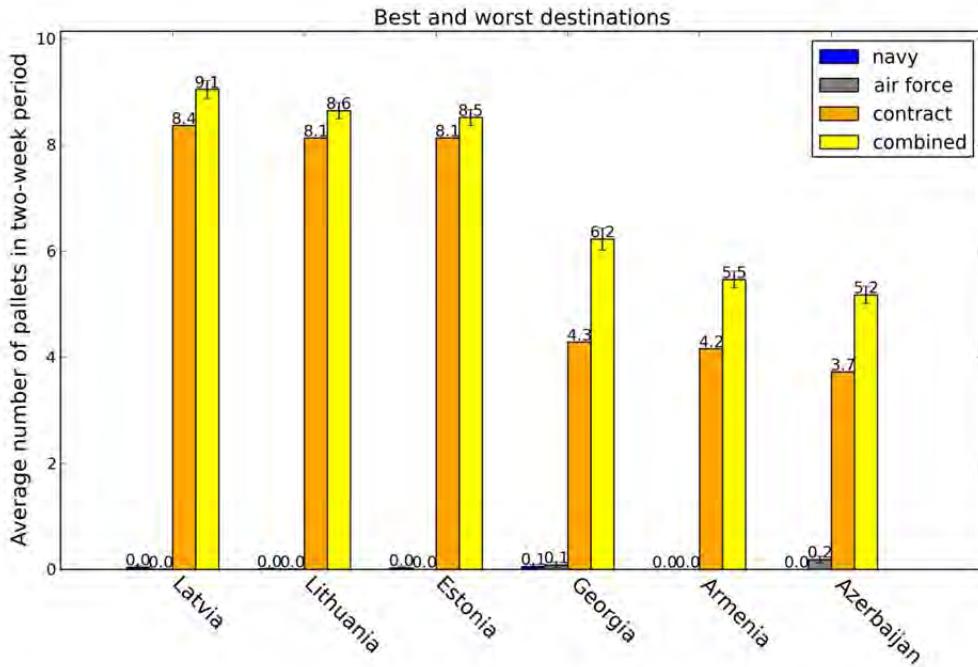


Figure 8. A bar graph of the average number of pallets delivered for four logistic scenarios to the three best-performing countries and the three worst-performing countries. The vertical axis represents the average number of pallets that can be transported in a two-week time period. Blue bars represent the Navy logistic network, orange bars the contract network, gray bars the Air Force network, and yellow bars the combined logistic network. The vertical lines above the bars represent 95% confidence intervals for the estimated performance of the network. Space-available networks generally offer little transportation capability to these countries. The contracting and combined networks have comparable performance, with combined operations outperforming slightly due to marginally smaller costs. For these results, a transportation budget of approximately \$10,000 per two-week time period is assumed, based on expenditures on the order of the FTP annual budget allocated equally among geographic COCOMs and spread evenly throughout the year.

Figure 9 depicts the estimated cost of shipping a single pallet from San Diego to each of the 17 countries of interest in the EUCOM AOR. The figure contrasts the cost of

shipping using contracting only as compared to a combined operation that uses space-available transportation when present. A combined operation allows for some decrease in cost, ranging from 15% to 30%, but does not offer significant improvements. This is consistent with historic research on peacetime transportation using contractors (Lewis, 1995).

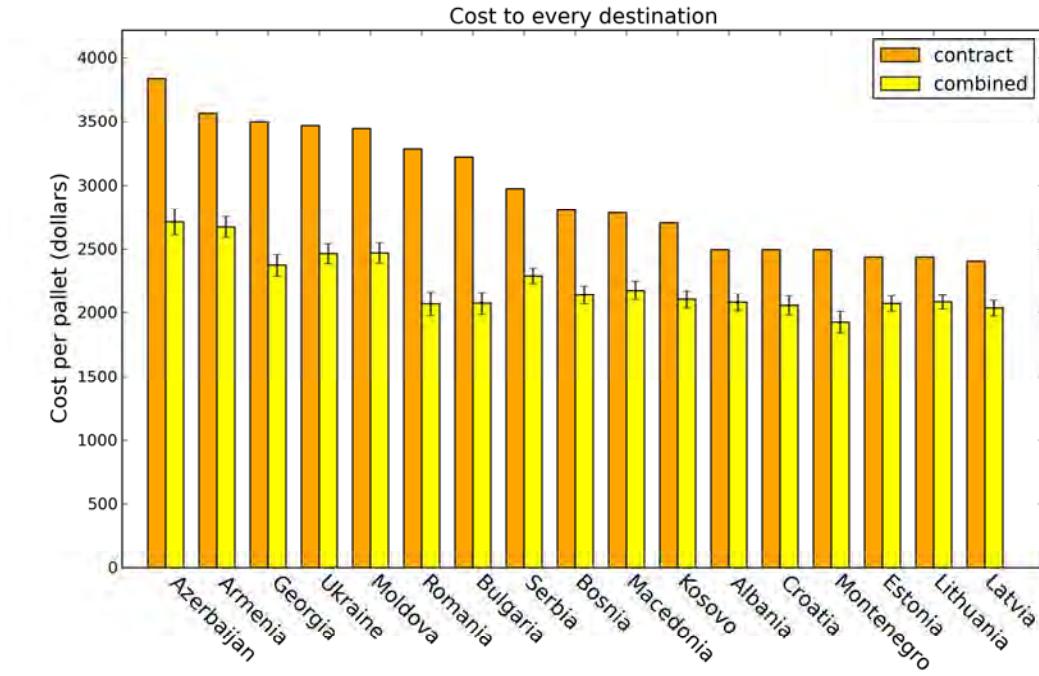


Figure 9. Estimated costs of shipping a single pallet to each EUCOM destination of interest. The orange bars represent costs using contract shipping only. The yellow bars represent costs from a combined operation, substituting space available for contract when possible. A combined operation offers approximately a 15% to 30% cost decrease over exclusively using contractors.

Finally, Figure 10 represents the total shipping capacity in pallets for a range of budget values. The vertical dashed line is at approximately \$10,000 per two weeks, which is approximately equal to \$260,000 per year—the value of splitting the FTP budget equally among the geographic COCOMs. The right-most extent of the horizontal axis is at a budget of approximately \$55,000 per two weeks, or approximately \$1.5 million per year—the value of the entire annual FTP budget. The yellow line indicates the performance of a combined operation, while the orange line indicates a contract-only operation. For an equal budget allocation, the combined operation offers approximately two more pallets per two-week period than a contract-only operation. This is more

significant at small budget values, but at a budget value of \$10,000 per two weeks, it is less than a 30% improvement.

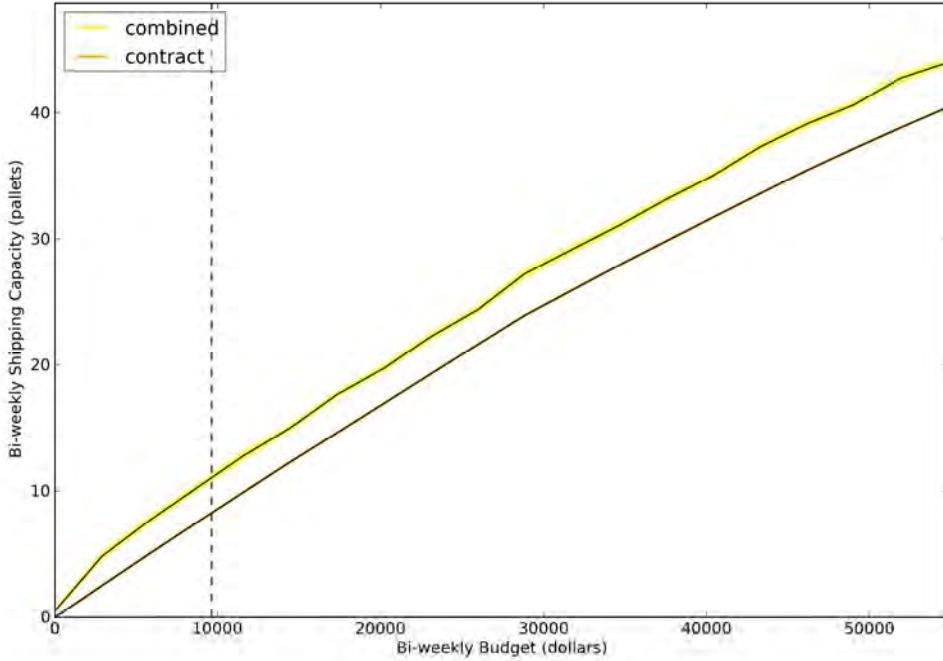


Figure 10. A comparison of contract-only operations and combined operations at a range of budget values. The vertical dashed line is at approximately 10,000 dollars per two weeks, or 250,000 per year—the value of the FTP budget, split evenly across the geographic COCOMs. At this value, a combined operation offers less than a 30% increase in capacity when compared to contract-only operations.

C. DISCUSSION AND CONCLUSIONS

The results of the analytical model indicate that space-available transportation is insufficient to address EUCOM HA shipping requirements. In addition, a cost comparison between contract-only operations and combined operations shows limited improvement for a combined operation. This, combined with the relatively easy execution of contract-only operations, suggests that allowing for contract transportation of EUCOM HA material may be a reasonable method of providing quality service for the COCOM relationship-building mission at a relatively low cost.

The results presented from the analytical model assume an optimistic 100% utilization of space available when present. In reality, human operators are likely unable

to achieve such a degree of utilization without significant automation improvements. One effort to create such automation improvements is the U.S. Fleet Forces Command's Lifts of Opportunity/Opportune Lift Program administered by the Navy Supply Logistics Operation Center. The goal of the program is to consider all scheduled conveyances and search for opportune lift. One aspect of the program is an automated Transportation Exploitation Tool (TET) available on the Secret Internet Protocol Router Network (SIPRNet) through a collaborative effort with the U.S. Department of Energy. The TET prototype provides Orbitz-like search capability for opportune lift.

Until tools such as TET become operational and widely available, human operators are required for scheduling and tracking space-available transportation. Even small amounts of underutilization lead to drastically reduced performance of space-available networks. For example, Figure 10 depicts wait times for an air network with 80% utilization (compare with Figure 6). Even at a relatively high level of 80% utilization, only 2 out of 17 EUCOM destinations of interest has a wait time of less than one year.

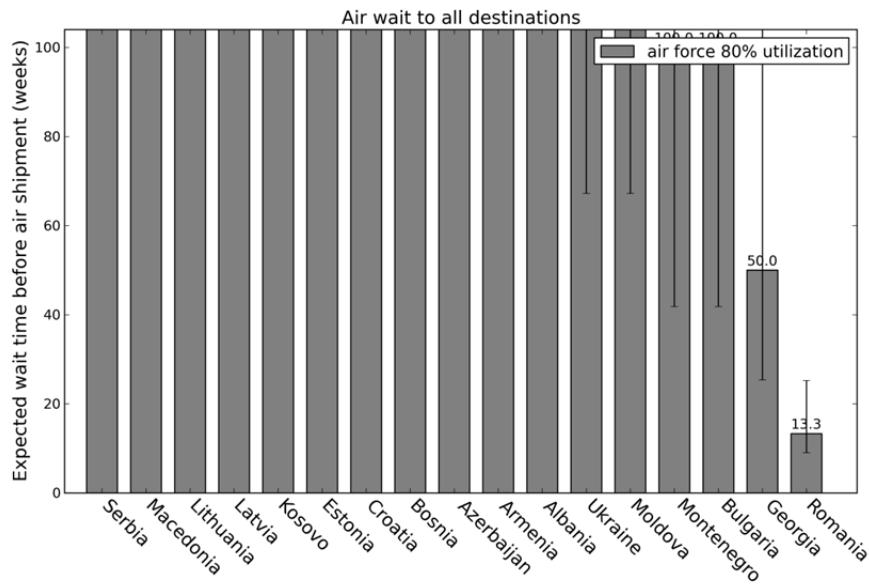


Figure 11. Expected wait times for an air network with 80% utilization of space-available channels. The performance of the network, even at a relatively high utilization of 80%, is significantly degraded when compared to the performance of a 100% utilization network (see Figure 6).

Space-available transport, especially to destinations with infrequent visits by DoD assets, is inherently unreliable, leading to long expected wait times before delivery. Contracted delivery provides increased reliability that could be advantageous to relationship-building missions. It may be possible to increase the reliability of space-available transport by purchasing some intermediate storage locations, where material can wait and increase the number of space-available connections. However, such intermediate storage locations would come at an additional cost.

While the model presented here is derived using current and thorough input data as well as modern modeling techniques, in any model there is no way of accounting for the multitude and complexity of human factors that make the real-world logistics operations work. Although critical to daily operations, these are elements that are impossible to model mathematically. Nevertheless, model results can provide insights into the capabilities of different logistics operations and the relative merits of varying policy decisions. To paraphrase a quote from George Box, all models are wrong, but some models are useful (Box, 1979).

LIST OF REFERENCES

- Box, G.E.P. (1979, May). *Robustness in the strategy of scientific model building*. Wisconsin University-Madison: Mathematics Research Center.
- Counterpart International. (2012). *Small medium transportation program*. Counterpart International. Retrieved from <http://www.counterpart.org/working-with-us/contracting-vehicles/smtp>
- Defense Security Cooperation Agency. (2003). *Security assistance management manual (SAMM) DoD 5105.38M*. Washington, D.C.: Defense Security Cooperation Agency.
- Defense Security Cooperation Agency. (2010). *Fiscal year 2009 report on humanitarian assistance*. Washington, D.C.: Defense Security Cooperation Agency.
- Department of Defense. (2008, July 18). *Joint logistics*. Joint Publication 4-0. Washington, D.C.: Department of Defense.
- Department of Defense. (2011). *The national military strategy of the United States of America: 2011 redefining America's military leadership*. Washington, D.C.: Chairman of the Joint Chiefs of Staff.
- Funded Transportation Program. (2011). *Denton/funded transportation program guideline* [PDF Document]. Retrieved from <https://hatransportation.ohasis.org/FundedTransportationProgram/FundedTransportationProgramGuidelines.pdf>. Washington, D.C.: Defense Security Cooperation Agency.
- Humanitarian Assistance. (2011). In *United States Code for Armed Forces: Title 10* (Subtitle A, Part IV, Chapter 152, Section 2561). Retrieved from http://www.law.cornell.edu/uscode/usc_sec_10_00002561---000-.html
- Joint Relief International, Inc. (2011). *The Denton program: Fiscal year 2010 & 2011*. Charleston, SC: United States Transportation Command.
- Lewis, T.A. (1995). *A comparison of AMC cargo channel flights and alternative commercial air freight carriers* (Master's Thesis). Monterey, CA: Naval Postgraduate School.
- Norman, K.W. (2011, March 2). Denton amendment allows Altus AFB to support humanitarian operations. Air Education and Training Command. Retrieved from <http://www.aetc.af.mil/news/story.asp?id=123244904>
- Office of the Chief of Naval Operations. (2006). *Project Handclasp*. Instruction 5726.3D. Washington, D.C.: Department of Defense.

Stavridis, J.G. (2010). *Partnership for the Americas: Western Hemisphere strategy and U.S. Southern Command*. Washington, D.C.: National Defense University Press.

Transportation of Humanitarian Relief Supplies to Foreign Countries. (2011). In *United States Code for Armed Forces: Title 10* (Subtitle A, Part I, Chapter 20, Section 402). Retrieved from http://www.law.cornell.edu/uscode/usc_sec_10_00000402--000-.html

United States European Command. (n.d.). *A strategy of active security* [PowerPoint slides].

United States Navy Project Handclasp. (2009). U.S. Navy's Project Handclasp: Consolidated report for CY09 [Data file].

United States Secretary of Defense. (2009). *Policy guidance for DoD overseas humanitarian assistance program (HAP)*. Washington, D.C.: United States Secretary of Defense.

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